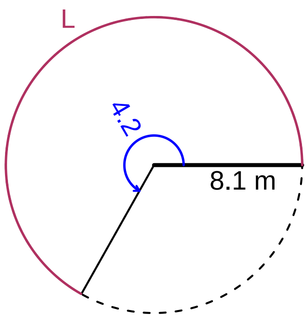
Name: Date:

Trig Final (Solution v22)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 8.1 meters. The angle measure is 4.2 radians. How long is the arc in meters?



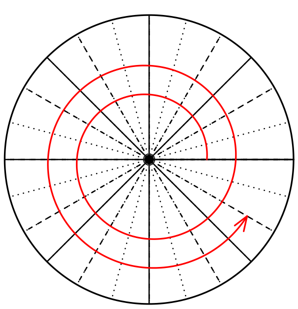
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 34.02$ meters.

Question 2

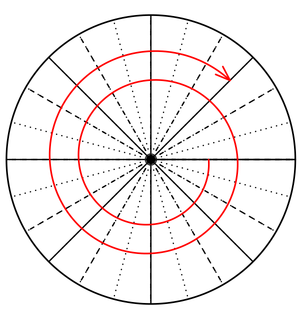
Consider angles $\frac{23\pi}{6}$ and $\frac{-15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{23\pi}{6}\right)$ and $\cos\left(\frac{-15\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{23\pi}{6}$



Find sin(23π/6)

Mark $\frac{-15\pi}{4}$



Find cos(−15π/4)

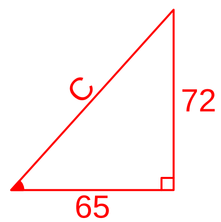
$\sin(23\pi/6) = \frac{-1}{2}$

$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-72}{65}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

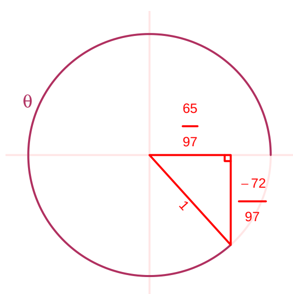
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$65^2 + 72^2 = C^2$$
$$C = \sqrt{65^2 + 72^2}$$
$$C = 97$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{65}{97}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -5.64$ meters, a frequency of 4.01 Hz, and an amplitude of 8 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8\cos(2\pi 4.01t) - 5.64$$

or

$$y = 8\cos(8.02\pi t) - 5.64$$

or

$$y = 8\cos(25.2t) - 5.64$$